

CLAIMS

- 5 1. Method in a digital communication system for transmitting a modulated bit stream comprising user data and dummy data, wherein the modulated user data is represented by symbols from a symbol alphabet M, the modulated dummy data is represented by a symbol m_0 , the method is **characterised by** the steps of:
- 10 (a)- generating (601a) symbols q_0, \dots, q_j randomly from a predefined symbol alphabet Q being a subset of the symbol alphabet M,
(b)- scrambling (602a) the bit stream by performing bitwise modulo-2 addition between the modulated bit stream and the randomly generated symbols q_0, \dots, q_j from Q, and
15 (c)- transmitting (603a) said scrambled bit stream, wherein the predefined symbol alphabet Q is defined so that the transmit power level of the dummy data is substantially lower than the transmit power level of the user data.
- 20 2. Method in a digital communication system for receiving a bit stream **characterised in** that the bit stream is transmitted and scrambled in accordance with claim 1, the method comprises the steps of:
- 25 (d)- generating (601b) symbols q_0, \dots, q_j randomly from the symbol alphabet Q in synchronisation with the transmitter of the received bit stream, and
(e)- scrambling (602b) the received bit stream in order to recreate estimated message symbols from symbol alphabet M by performing bitwise modulo-2 addition between the received bit stream and the randomly generated symbols q_0, \dots, q_j from Q.
- 30 3. Method according to any of claims 1 and 2, wherein the bit stream is modulated with Quadrature Amplitude Modulation (QAM).
4. Method according to claim 3, wherein the QAM is 16-QAM.

- 5 5. Method according to any of claims 1 or 4, wherein Q comprises four message points $\{q_0, q_1, q_2, q_3\}$ representing signal vectors $\{s_0, s_1, s_2, s_3\}$, wherein the length of all of the signal vectors is equal, i.e., $\|s_0\| = \|s_1\| = \|s_2\| = \|s_3\|$ and the angle increment from s_0 to s_1 , s_1 to s_2 , s_2 to s_3 and s_3 to s_0 , respectively is 90 degrees.
6. Method according to claim 5, wherein Q comprises the four innermost message points of the symbol alphabet M.
- 10 7. Method according to any of previous claims, wherein the randomly generated symbols from Q is generated by applying a pseudo-random binary sequence generator to a lookup table wherein the symbol alphabet Q and m_0 are stored.
- 15 8. Method according to any of previous claims, wherein the modulated dummy data m_0 is consistently represented by zeros or consistently represented by ones.
- 20 9. Method according to any of previous claims 1-8, wherein the method is applied on VDSL.
- 25 10. A computer program product directly loadable into the internal memory of a computer within a mobile station or a base station transceiver in a communication system, comprising the software code portions for performing the steps of any of claims 1-9.
- 30 11. A computer program product stored on a computer usable medium, comprising readable program for causing a computer, within a mobile station or a base station transceiver in a communication system, to control an execution of the steps of any of the claims 1-9.
12. Transmitter (400) in a digital communication system comprising means for transmitting a modulated bit stream comprising user data and dummy data, wherein the modulated user data is represented by

- 5 symbols from a symbol alphabet M, the modulated dummy data is represented by a symbol m_0 , **characterised by** means (401, 402) for generating symbols q_0, \dots, q_j randomly from a predefined symbol alphabet Q being a subset of M, means for scrambling the bit stream by performing bitwise modulo-2 addition between the modulated bit stream and the randomly generated symbols q_0, \dots, q_j from Q, and means for transmitting said scrambled bit stream, wherein the predefined symbol alphabet Q is defined so that the transmit power level of the dummy data is substantially lower than the transmit power level of the user data.
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13. Receiver (404) in a digital telecommunication system comprising means for receiving a bit stream **characterised in** that the bit stream is transmitted and scrambled by a transmitter in accordance with claim 10, the receiver further comprises means (405, 406) for in synchronisation with the transmitter (400) of the received bit stream generating symbols q_0, \dots, q_j randomly from the symbol alphabet Q, and means for scrambling the received bit stream by performing bitwise modulo-2 addition between the received bit stream and the randomly generated symbols q_0, \dots, q_j from Q in order to recreate estimated message symbols from symbol alphabet M.
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14. Transmitter (400) according to claim 12 or receiver (404) according to claim 13, wherein the bit stream is modulated with Quadrature Amplitude Modulation (QAM).
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15. Transmitter (400) or receiver (404) according to claim 14, wherein the QAM is 16-QAM.
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16. Transmitter (400) or receiver (404) according to any of claims 12-15, wherein Q comprises four message points $\{q_0, q_1, q_2, q_3\}$ representing signal vectors $\{s_0, s_1, s_2, s_3\}$, wherein the length of all of the signal vectors is equal, i.e., $\|s_0\| = \|s_1\| = \|s_2\| = \|s_3\|$ and the angle increment from s_0 to s_1 , s_1 to s_2 , s_2 to s_3 and s_3 to s_0 respectively is 90 degrees.

17. Transmitter (400) or receiver (404) according to claim 16, wherein Q comprises the four innermost message points of the symbol alphabet M.
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18. Transmitter (400) or receiver (404) according to any of previous claims 12-17, wherein the randomly generated symbols from Q is generated by applying a pseudo-random binary sequence generator (401;405) to a lookup table (402;406) wherein the symbol alphabet Q and m_0 are stored.
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19. Transmitter (400) or receiver (404) according to any of previous claims 12-18, wherein the modulated dummy data m_0 is consistently represented by zeros or consistently represented by ones.
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20. Transmitter (400) or receiver (404) according to any of previous claims 12-19, wherein the transmitter (400) or receiver (404) is applied on VDSL.
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21. Transceiver in a digital communication system **characterised in** that it comprises the transmitter according to any of claims 11, 13-18 and the receiver according to any of claims 12-18.